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5 SPECIFICATION.

TITLE OF INVENTION: MULTI KNIFE CUTTING DEVICE

Embodiment 1. Rotary action.

Embodiment 2. Independent knife movement.

10 Embodiment 3. Multi knife cutting device, Inclined cutting action..

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REFERENCE: This non-provisional application corresponds to
provisional application number 60/ 300,605, dated June 25th 2001.

CROSS REFERENCE TO RELATED APPLICATIONS

Not applicable as this is a provisional application.

However I would like to mention that my application no.98/MAS/2001 dated 5th Feb 2001 is
 5 pending with the Patent office, Chennai, for the same invention. Several improvements and
 modifications, which are a result of testing the prototypes after Feb 1st 2001, have been included
 in the US application.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH

10 Not Applicable

REFERENCE TO A MICRO FICHE APPENDIX

Not applicable

BACKGROUND OF THE INVENTION

The invention described in this application belongs to the field of kitchen gadgets for cutting
 15 vegetables which are labor saving. The subject matter of the invention falls under the U.S. patent
 classification "083 - CUTTING".

I am listing below some US patents which I came across during a search in the database.

The devices, which I have invented, have no similarities with these.

<u>US Patent no.</u>	<u>Title</u>
20 6,148,704	Vegetable cutting device
6,052,910	Vegetable cutting device
5,950,515	Apparatus for slicing vegetables

There are some more patented multi knife devices, a list of which is enclosed.

The components used are knives, levers, ~~springs~~, fasteners, ~~stainless steel structurals~~, wooden
 25 board, plastic parts etc, which are items in common use. They have been designed and
assembled in a novel way to obtain a new and improved device for cutting vegetables.

The prior art is cutting Vegetables with 1) a utility knife 2) Crank operated rotary cutter 3) a
 vertical knife fixed to a 50x 100x 500 mm wooden base, in addition to the multi knife devices.

The problems in cutting vegetables with a standard utility knife are well known and are
 30 listed below.

- Skill development to ensure cutting is done without hurting the finger.
- Pressure related strain on the hand.
- Slow and tedious work which is repetitive
- Knife touching the board causing scratches

- Problem of excessive effort in cutting hard vegetables
- Danger of knife slipping
- Cutting finger chips is laborious
- Both hands are to be used, one for holding, one for cutting
- 5 - Reluctance to do the job as it is tedious work.
- Getting uniform size is difficult
- Damage to knife handle due to constant pressure.

Problems in the prior art of multi knife devices.

Buckling of knives,

- 10 Vegetables remaining stuck between the knives,

Sliding of vegetables,

Knife frames increasing the load arm and reducing the lever advantage.

This invention should not be compared with food processors as they are motorized and the type of cutting is not comparable.

- 15 The Rotary type manual devices for vegetable cutting are also not comparable as sheet metal slits are used for cutting and they cannot be compared to knives for cutting quality.

I was motivated to invent a more productive mechanism after seeing the drudgery inherent in cutting vegetables especially if one happens to be a vegetarian.

BRIEF SUMMARY

- 20 The invention " Multi knife cutting device, Inclined cutting action " comprises a multi knife assembly, a base cum guide and a means of connection between them. Lever action is made use of to reduce cutting effort.

The object of the invention is to provide a trouble free multi knife vegetable cutting device which is time and labor saving. The novel design features which separate it from prior art are

- 25 detailed in the section " Detailed description of the Multi knife cutting device "

Three embodiments. One embodiment will be described in the following pages.

Embodiment 1- Multi-knife cutting device, Rotary action,

Embodiment 2- Multi-knife cutting device, independent knife movement,

Embodiment 3. The title of the embodiment is "Multi knife cutting device, Inclined cutting

- 30 action."

The advantages of the new invention are: -

- * The increase in productivity
- The time saving
- Increased safety

- No fear of cutting fingers
- Even unskilled persons can do the job after a few minutes training
- Uniformity in size
- Use of lever action to gain mechanical advantage
- 5 • Elimination of pressure induced injuries on the knife holding fingers
- As the time taken is reduced, it results in cost reduction.

The improvements due to the novel design features in the invention are :

There is no buckling or misalignment of knives due to improved guiding,

Sliding of vegetables is prevented,

- 10 The cut pieces do not remain stuck between the knives after the cut,
- The device is compact and sturdy using proper knives.

BRIEF DESCRIPTION OF DRAWING VIEWS.

	Sheet no.	Fig.no.	Details
	1 / 3	1	Elevation rotary knife assembly
5	1 / 3	2	Plan rotary knife assembly
	1 / 3	3	Section XX, fig 4
	1 / 3	4	Plan view, base cum guide, rotary action embodiment
	2 / 3	5	Elevation Independent action embodiment
	2 / 3	6	Plan do -
10	3 / 3 1 / 1	7 1	Elevation Inclined cutting action embodiment
	3 / 3 1 / 1	8 2	End view of base cum guide in direction A.

DETAILED DESCRIPTION OF THE MULTI KNIFE CUTTING DEVICE WITH THREE EMBODIMENTS.

EMBODIMENT- 1. MULTI KNIFE CUTTING DEVICE, ROTARY ACTION.

Fig. No. 1. Elevation of rotary knife assembly

5 Fig. No. 2. Plan view, rotary knife assembly,

Fig. No. 3. Section XX, of fig. no. 4,

Fig. no. 4. Plan view, base cum guide.

Construction details

10 This embodiment of the invention uses an assembly of rotary knives instead of straight knives along with a specially designed base cum guide to accomplish the task of cutting vegetables. Stand alone knife assembly cannot perform the task. This device is meant for light work because of the features of the design.

15 Six rotary knives part 1 of 0.6 mm thickness and 72 mm diameter are held together by a 4mm bolt at location number 4 as shown in Fig 1 and 12 1 and 2. The knives are made from grade 420 Stainless Steel. There is a gap of 12 mm between the knives as illustrated in Fig-12 2. The handle 2 extends beyond the fulcrum 4. A spacer 3, 1.2 mm thick is inserted between handles to facilitate play for the knives to rotate. Bolts shown at location 5 hold the handles together. The handles are 11mm thick, 20mm wide and 190mm long, made of wood or plastic.

20 The base cum guide, part 5, 7 (20x135x260mm), which can be made of plastic or wood is designed to guide the knives during rolling and separate the cut pieces from the knives after the cutting is over. There are six grooves part 8 in the board 7 as shown in figure no 14 4. Each groove is 5 mm deep and 1.2 mm wide and runs all through the board length. There is an end stop cum guide with slots part 6 (20x40x135mm) made of wood and screwed to the board part 7 at the end as shown in fig 14 fig 4. It has vertical slots 1.2 mm wide corresponding with the grooves in the board.

Functional description

30 The vegetables are spread on the board base cum guide before the end stop 6 Fig-14 4. The roller knife assembly part 1 is placed in the grooves 8 and is rolled over the vegetables simultaneously applying downward force. The assembly 1 is pulled towards the slot in the end stop till the knives pass through the slot. The end stop separates the cut pieces from between the knives. The handle extension in the front of the knife prevents the cut pieces from traveling with the knife. With this single operation all the vegetables are cut into small pieces and get separated

from the knives. This operation is several times faster than using a single roller knife. This device is meant for cutting items, which are not hard for example okra, beans etc.

The use of rotary action knives for vegetable cutting is a novel feature.

~~EMBODIMENT 2:~~

5 ~~MULTI KNIFE CUTTING DEVICE, INDEPENDENT KNIFE MOVEMENT.~~

Figure. 5 Elevation view.

Figure. ~~6~~ Plan view.

Construction details.

10	Part 1	Support	3x30x65 mm	st. steel
	Part 2	bolt for knife assembly	6x90 mm	st. steel
	Part 3	guide with slots	48x52x100 mm	Plastic
	Part 4	Knife	1x25x160 mm	St. steel gr. 420
	Part 5	End stop	20x30x75 mm	Plastic
15	Part 6	Knife handle	6x25x100 mm	Plastic
	Part 7	Base cum guide	20x75x270 mm	wood/plastic
	Part 8	Spacer	6x8 mm	different lengths

The supports part 1 are screwed on to the base cum guide part 7 at one end as shown in fig 5 adjacent to the guide with slots part 3, containing 6 slots 3 mm wide

- 20 Part 3 is stuck to the base cum guide with adhesive at the location shown in fig 19 ~~5~~. The six knives part 4 fitted with handles part 6, are fitted to the supports 1 using the bolt and spacers, part 2 and 8 so that the knives align with the slots in platform part 3. The end stop part 5 determines the position of the knife, leaving a clearance below and above the knife at the end of the stroke. The vertical position is the starting position of the knives wherein, the knives are partly in the
- 25 slots due to the close proximity of the knife fulcrum to the slots.

Functional description.

- The whole potato is placed on the platform of part 3 close to the raised edge at one end designed to stop vegetable sliding, with the knives part 4 in vertical position. Then the knives are brought down and touch the potato top. The center distance between the knives is 8mm. To
- 30 cut the potato into slices the knives are brought down in quick succession into the slots. It is also possible to use two outer knives simultaneously without causing over load. It is not advisable to bring down all the knives simultaneously as the potato is large in size, which will cause the knives to bend sideways. This device is safer than single knife as the fingers are away

from the knife. The device is also faster as all the knives are ready for cutting and there is no upward stroke for each knife cut separately. The slices are uniform giving better appearance. This device can also be used for cutting of Okra, beans and slices of potato into small pieces by using all knives simultaneously. In this case the knives do not bend as the vegetable thickness is small compared to a whole potato. This device can be classified as multi purpose as the knives can be used separately or simultaneously depending on the thickness of the item being cut.

Distinctive features

The mounting of knives without using a separate knife frame reduces the load arm of the lever. The knife guiding is continuous as part of the knives are in the slot of the guide from the starting position, which results in trouble free cutting.

The guide slots stop the cut pieces from traveling with the knives, when the knives go below the top surface of the guide with slots at the end of cutting stroke.

The location of the knife fulcrum right next to the vegetable platform, minimizes the load arm and increases the mechanical advantage.

There is flexibility in choosing the number of knives for cutting depending on the type of vegetable.

The endstop part 5 stops the knife edges from touching the board at the end of cutting.

EMBODIMENT 3. MULTI KNIFE CUTTING DEVICE. INCLINED CUTTING ACTION.

This is a new vegetable cutting device using multiple knives with several innovative features, making it distinct from any other cutting device. These features will be described at the end of this section.

This is the best mode considering compactness, and versatility in operation.

Fig.no. 7.1. Elevation view, knives horizontal, dotted lines show knives vertical position.

Fig.no. 8.2. End view of base cum guide without knives, direction A fig.7. 1.

PART LIST

Part no.	Name	Quantity	Material	Dimension in mm
1	Knife	6	SS 420	1x 24x160
2	screw	12	steel	4 dia
3	handle	2	Al/laminate	6x24x170
4	fulcrum screw	1	steel	4 dia
5	Vegetable enclosure	1	Al/ laminate	---
6	Guides/	7	Al/laminate	6x129 ht
7	base angle	2	Al	2x20x25

8	Spacers	6	laminatc	2x20x76
9	Slots for knives	6	--	2 wide
10	screws	2	steel	4 dia
11	End stop	1	wood	

5

Construction.

The appearance is shown in fig numbers 7 and 8- 1 and 2

Six numbers of knives part 1 are mounted in a frame base cum guide made up of part 6 guides, part 7 base angle, spacers part 8, and part 10 screws to join them together into a frame. base cum
10 guide.

The knives are joined to the base cum guide by a 4mm screw at location marked 4. The screw acts as a fulcrum for the movement of the knives. The slot in which the knife is mounted is 2mm wide and the knife is 1 mm thick. The 1 mm gap is filled up by a 1mm thick and 24mm dia laminate washers, 6 numbers, on the fulcrum screw. This makes the knives move without play
15 and function better. The outer 4 knives are assembled into one handle ,part3,170 mm long and the center 2 knives are assembled into another handle. These two groups of knives can be operated together or separately .

The guides part 6 form an enclosure of 60 x 60 mm ,the bottom surface of which is the support platform for the vegetables.

20 Functional description.

The device is placed on a flat surface as shown if fig 22. 1.

The 6 knives are taken back by about 45 degrees from the vertical position forming a gap between the knives and the platform. The vegetables are placed on the platform. The knives are moved clockwise by hand pressing at the extreme end of the two handles to gain maximum lever
25 advantage. The stroke comes to an end in the horizontal position after slicing through the vegetables touching the end stop part 11.

The cut pieces are lying free on the platform and can be removed by pushing with a wooden piece or by tilting the whole device to the right.

Now the device is ready for the next cutting operation.

30 This embodiment is the best mode because of the following.

- The knives are guided through the full cutting operation by the guides part 6 preventing them from bending so that the cutting is smooth.
- It can cut a full potato of section 60 x 60 mm into slices or fingers as the knives are supported on the sides. For this operation the outer four knives are to be used first for

cutting while the center two knives are pressing the potato in the middle. The center knives can be pushed down immediately after the outer knives become horizontal.

- For light cutting jobs like 6 numbers Okra at a time all the 6 knives can be used simultaneously saving time.

5 ~~The distinctive features of this embodiment are;~~

~~Direct mounting of the knives in the guide with slots, eliminating a frame,~~

~~Vegetable enclosure giving positive support to the vegetables from sliding,~~

~~End-stop part 11 stopping the knives before the edges touch the base,~~

~~Knives entering guide slots below the vegetables, leaving the cut pieces free.~~

10 ~~The lever advantage is increased due to the direct mounting of knives next to the vegetable enclosure.~~

~~There is flexibility in choosing the number of knives, to suit the type of vegetable being cut.~~

Novel features of this embodiment of the invention which distinguish it from prior art

15 inventions.

The design features of this embodiment of the invention which are novel are explained below.

- The base cum guide comprising of parts 6,7,8,10.

20 The base cum guide is the main structure which supports the knives and vegetables. Part 6 guide is the main component of the structure which supports all other parts. Part 6 is made of 6mm thick composite or ABS plastic or aluminum if weight is not a criteria. As seen from fig 7 the guide part 6 has a rectangle shape with a recess inside for keeping the vegetables, called part 5 vegetable enclosure in the part list. Seven numbers of these 6 mm thick elements are assembled together using angles part 7, spacers part 8 and screws part 10 to make a strong, novel and versatile structure for supporting the knives and vegetables. This type of structure

25 has great strength to support the knives and give them positive guiding in their travel to restrict bending and misalignment. In the prior art the base structure is made of sheet metal in most cases, which is not strong and does not cover the knives during their travel. It is a novel design to combine seven plate like elements to make a versatile structure for this device.

30 This is also a novel concept where one structure achieves many functions and is at the same time compact, sturdy and easy to manufacture. The various functions of this assembly, base cum guide are listed below.

Supporting the knives through a fulcrum bolt,

Formation of slots between successive guides to keep the knives in position during their travel from beginning to end.

Preventing the knives from bending and misalignment as the guides are always in contact with the knives beyond the vegetable enclosure, as the guides guide the knives from beginning to the end of their travel.

5 Formation of the vegetable enclosure within the guides very next to the vertical starting position of the knives. This reduces the load arm of the lever and increases mechanical advantage.

By covering the knives beyond the vegetable enclosure, the guides are effectively reducing the knife length subjected to bending loads. This reduces knife bending to a large extent as the deflection is proportional to the ^{third} ~~fourth~~ power of the length.

10 • Vegetable enclosure part 5, fig 1.

As seen in fig 1 the vegetable enclosure is formed within the base cum guide assembly. The reduction in the load arm due to its location is explained in the section on base cum guide.

15 The enclosure stops the vegetables from sliding as they are supported by the vertical wall of the enclosure. This is a solid support. In the prior art the supports are not present or not of sufficient size to stop sliding.

As the enclosure is covered on four sides, the vegetables become self supporting. There is no need to hold them during cutting.

• Slots below the vegetable enclosure.

20 The guides part 6 form the slots even below the vegetable enclosure 5. The knives enter the respective slots after cutting through the vegetables and come to a stop when the handles touch part 11 end stop. As a result of this design the cut pieces remain on the base of the enclosure completely free from the space between the knives without any extra effort. This is a novel feature. In much of the prior art this feature is not there or it is not of such quality and strength. The end stop stopping the knives ensures that the knife edges are saved from
25 damage.

• Mounting of knives.

30 In this invention there is no frame to hold the knives in place before they are mounted on the base. They are mounted directly on the base cum guide using a fulcrum bolt part 4, fig 1. This is a novel feature and increases the lever advantage as the load arm is reduced in direct mounting.

The direct mounting makes the device simple and compact.

It also facilitates the possibility of using 2, 4 or 6 knives as the handles are joined in 4 plus 2 fashion. This is of help when cutting hard and large vegetables.

The absence of knife frame increases access to the device and also eliminates the fouling of large vegetables with the knife frame.

All the above features make the device compact, sturdy, easy to use and very effective in making smooth cuts with multiple knives.

- 5 In addition to dicing of vegetables, this device is capable of making French fries from whole potatoes without changing any knives. This is a feature which is distinguishing from prior art.

10 OTHER DESIGN VARIATIONS WITH THE SAME PRINCIPLE

The description of ~~three~~ the embodiment s in the preceding pages is considered as an illustration of the design principles of the invention and is not an exhaustive collection of all the variations.

- 15 The invention is not limited to the ~~three~~ embodiments described in this application. All feasible modifications and variations within the scope of the invention may be resorted to in due course.

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